AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1   1. (Currently amended) A method for detecting violations of type rules in a
2 computer program, comprising:
3   receiving the computer program prior to compilation and execution,
4 wherein the computer program is received in source code form, and wherein the
5 method further comprises parsing the computer program into an intermediate form
6 prior to locating a type casting operation;
7   locating a the type casting operation within the computer program,
8 wherein the type casting operation involves a first pointer and a second pointer;
9   checking the type casting operation for a violation of a type rule; and
10   if a violation is detected, indicating the violation.

1   2. (Original) The method of claim 1, wherein checking the type casting
2 operation involves determining if the first pointer is defined to be a structure
3 pointer and the second pointer is not defined to be a structure pointer, and if so,
4 indicating a violation if no char exception applies.

1   3. (Original) The method of claim 2, wherein indicating the violation
2 involves:
3   generating a warning to warn a programmer of a potential type violation if
4 the second pointer is a void or char pointer; and

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5   generating an error to indicate a type violation to the programmer if the

6   second pointer is a pointer to a scalar.

1   4. (Original) The method of claim 1, wherein if the first pointer is defined

2   to point to a first structure type and the second pointer is defined to point to a

3   second structure type, the method further comprises:

4   determining whether the first structure type and the second structure type

5   belong to the same alias group; and

6   if the first structure type and the second structure type do not belong to the

7   same alias group, generating an error to indicate a type violation.

1   5. (Original) The method of claim 4, wherein determining whether the first

2   structure type and the second structure type belong to the same alias group

3   involves:

4   keeping track of special program statements that link structure types into

5   alias groups;

6   determining that the first structure type and the second structure type

7   belong to the same alias group if the first structure type and the second structure

8   type are the same structure type, or if one or more special procedures link the first

9   structure type and the second structure type into the same alias group.

1   6. (Original) The method of claim 5, further comprising determining that

2   the first structure type and the second structure type belong to the same alias

3   group if the first structure type and the second structure type have all the same

4   basic types in the same order.

1   7. (Canceled).

1   8. (Original) The method of claim 1, further comprising:

2   receiving an identifier for a set of constraints on memory references that a

3   programmer has adhered to in writing the computer program; and

4   using the identifier to select a type casting rule from a set of type casting

5   rules, the selected type casting rule being associated with the set of constraints;

6   wherein each type casting rule in the set of type casting rules is associated

7   with a different set of constraints on memory references.

1   9. (Original) The method of claim 1, wherein the method is performed by a

2   compiler.

1   10. (Original) The method of claim 1, wherein the method is performed by

2   an error checking application, which is not part of a compiler.

1   11. (Currently amended) A computer-readable storage medium storing

2   instructions that when executed by a computer cause the computer to perform a

3   method for detecting violations of type rules in a computer program, the method

4   comprising:

5   receiving the computer program prior to compilation and execution,

6   wherein the computer program is received in source code form, and wherein the

7   method further comprises parsing the computer program into an intermediate form

8   prior to locating a type casting operation;

9   locating a the type casting operation within the computer program,

10   wherein the type casting operation involves a first pointer and a second pointer;

11   checking the type casting operation for a violation of a type rule; and

12   if a violation is detected, indicating the violation.

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1   12. (Original) The computer-readable storage medium of claim 11,

2   wherein checking the type casting operation involves determining if the first

3   pointer is defined to be a structure pointer and the second pointer is not defined to

4   be a structure pointer, and if so, indicating a violation if no char exception applies.

1   13. (Original) The computer-readable storage medium of claim 12,

2   wherein indicating the violation involves:

3   generating a warning to warn a programmer of a potential type violation if

4   the second pointer is a void or char pointer; and

5   generating an error to indicate a type violation to the programmer if the

6   second pointer is a pointer to a scalar.

1   14. (Original) The computer-readable storage medium of claim 11,

2   wherein if the first pointer is defined to point to a first structure type and the

3   second pointer is defined to point to a second structure type, the method further

4   comprises:

5   determining whether the first structure type and the second structure type

6   belong to the same alias group; and

7   if the first structure type and the second structure type do not belong to the

8   same alias group, generating an error to indicate a type violation.

1   15. (Original) The computer-readable storage medium of claim 14,

2   wherein determining whether the first structure type and the second structure type

3   belong to the same alias group involves:

4   keeping track of special program statements that link structure types into

5   alias groups;

6   determining that the first structure type and the second structure type

7   belong to the same alias group if the first structure type and the second structure

8   type are the same structure type, or if one or more special procedures link the first

9   structure type and the second structure type into the same alias group.

1   16. (Original) The computer-readable storage medium of claim 15,

2   wherein the method further comprises determining that the first structure type and

3   the second structure type belong to the same alias group if the first structure type

4   and the second structure type have all the same basic types in the same order.

1   17. (Canceled).

1   18. (Original) The computer-readable storage medium of claim 11,

2   wherein the method further comprises:

3   receiving an identifier for a set of constraints on memory references that a

4   programmer has adhered to in writing the computer program; and

5   using the identifier to select a type casting rule from a set of type casting

6   rules, the selected type casting rule being associated with the set of constraints;

7   wherein each type casting rule in the set of type casting rules is associated

8   with a different set of constraints on memory references.

1   19. (Original) The computer-readable storage medium of claim 11,

2   wherein the method is performed by a compiler.

1   20. (Original) The computer-readable storage medium of claim 11,

2   wherein the method is performed by an error checking application, which is not

3   part of a compiler.

1   21. (Currently amended) An apparatus that detects violations of type rules

2   in a computer program, comprising:

3   a receiving mechanism that is configured to receive the computer program

4   prior to compilation and execution;

5   wherein the receiving mechanism is configured to receive the computer

6   program in source code form; and

7   wherein the apparatus further comprises a parsing mechanism that is

8   configured to parse the computer program into an intermediate form prior to

9   locating a type casting operation

10   a locating mechanism that is configured to locate a̶ the type casting

11   operation within the computer program, wherein the type casting operation

12   involves a first pointer and a second pointer; and

13   a type rule checking mechanism that is configured check the type casting

14   operation for a violation of a type rule, and if a violation is detected, to indicate

15   the violation.

1   22. (Currently amended) The apparatus of c̶l̶a̶i̶m̶ ̶1̶claim 21, wherein the

2   type rule checking mechanism is configured to determine if the first pointer is

3   defined to be a structure pointer and the second pointer is not defined to be a

4   structure pointer, and if so, to indicate a violation if no char exception applies.

1   23. (Original) The apparatus of claim 22, wherein the type rule checking

2   mechanism is configured to:

3   generate a warning to warn a programmer of a potential type violation if

4   the second pointer is a void or char pointer; and to

5   generate an error to indicate a type violation to the programmer if the

6   second pointer is a pointer to a scalar.

1   24. (Original) The apparatus of claim 21, wherein if the first pointer is

2   defined to point to a first structure type and the second pointer is defined to point

3   to a second structure type, the type rule checking mechanism is configured to:

4   determine whether the first structure type and the second structure type

5   belong to the same alias group; and to

6   generate an error to indicate a type violation if the first structure type and

7   the second structure type do not belong to the same alias group.

1   25. (Original) The apparatus of claim 24, wherein in determining whether

2   the first structure type and the second structure type belong to the same alias

3   group, the type rule checking mechanism is configured:

4   keep track of special program statements that link structure types into alias

5   groups; and to

6   determine that the first structure type and the second structure type belong

7   to the same alias group if the first structure type and the second structure type are

8   the same structure type, or if one or more special procedures link the first structure

9   type and the second structure type into the same alias group.

1   26. (Original) The apparatus of claim 25, wherein the type rule checking

2   mechanism is configured to determine that the first structure type and the second

3   structure type belong to the same alias group if the first structure type and the

4   second structure type have all the same basic types in the same order.

1   27. (Canceled).

1   28. (Original) The apparatus of claim 21, wherein the receiving

2   mechanism is configured to receive an identifier for a set of constraints on

3   memory references that a programmer has adhered to in writing the computer

4   program, and further comprising:

5   a selection mechanism that is configured to use the identifier to select a

6   type casting rule from a set of type casting rules, the selected type casting rule

7   being associated with the set of constraints;

8   wherein each type casting rule in the set of type casting rules is associated

9   with a different set of constraints on memory references.

1   29. (Original) The apparatus of claim 21, further comprising a compiler

2   that contains the receiving mechanism, the locating mechanism and the type rule

3   checking mechanism.

1   30. (Original) The apparatus of claim 21, further comprising an error

2   checking application, which is not part of a compiler;

3   wherein the error checking application contains the receiving mechanism,

4   the locating mechanism and the type rule checking mechanism.